

Orthopaedic geriatric care—Is it effective?

A prospective population-based comparison of outcome in fractured neck of femur

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ABSTRACT – Orthopaedic geriatric care has become widely accepted despite relatively little formal evaluation. In the East Dorset health authority all patients with fractured neck of femur initially share common orthopaedic facilities but only those from one geographical sector have subsequent access to an orthopaedic geriatric unit, patients from the other sector receiving standard care. We have carried out a prospective population-based comparison of the outcome of 155 consecutive incident cases of fractured neck of femur aged over 65 years. On admission to hospital the two populations were similar in respect of age, sex, fracture type, social status, medical and orthopaedic problems, mental status and dependency (Clifton assessment procedure for the elderly). Multiple regression analysis showed that the mean length of stay was 9.5 days shorter in patients from the sector with access to orthopaedic geriatric care ($p < 0.05$, 95% confidence interval 0.6 to 18.4 days). This reduction was not due to any difference between the two groups as regards dependency or the level of support provided on discharge. There was no difference in outcome at 6 months post-operatively in terms of mortality, functional outcome (pain and mobility), change in dependency or social status. We conclude that in the East Dorset health authority this combined approach has resulted in a significant reduction in the length of inpatient stay without any other apparent effect on patient outcome.

The original concept of liaison between orthopaedic surgeons and geriatricians (orthopaedic geriatric care) in managing the elderly trauma patient was developed by Devas and Irvine in Hastings in the late 1950s [1,2]. The approach has become widely accepted but until recently was subject to little formal evaluation. The three randomised controlled trials published to date have produced conflicting evidence concerning the benefits of orthopaedic geriatric care [3–5]. Several

authors have suggested possible mechanisms by which combined management might influence outcome, but this area has not been examined in detail [6, 7]. The report of the Royal College of Physicians on fractured neck of femur states: 'Confirmation or refutation of the value of orthogeriatric units and other management schemes must be carried out by well designed prospective control studies' [8].

East Dorset has a high proportion of elderly residents in whom fractured neck of femur is an increasing problem. The health authority has responsibility for 442,000 total population, 100,000 being over the age of 65 years. Since 1976 the trauma service (86 beds) has been centralised at Poole General Hospital, cold orthopaedics (105 beds) being carried out 10 miles away at Christchurch Hospital. The average number of beds at Poole General occupied by orthopaedic patients rose substantially during the late 1970s. At peak periods up to 60 patients were boarding out on other wards. The problem was attributed to the large numbers of elderly patients with fractured neck of femur who were blocking beds.

In response to this situation an orthopaedic geriatric unit was established at Christchurch Hospital in December 1983. It was intended to serve the population from one geographical sector (sector A), those from the other sector (sector B) continuing to receive traditional care with relatively little involvement of the geriatricians. This situation provided the opportunity to determine the influence of orthopaedic geriatric care by comparing the outcome following fractured neck of femur in two populations receiving initially identical orthopaedic management.

The aims of the study were:

—To determine whether the outcome of elderly patients with fractured neck of femur is improved by having access to an orthopaedic geriatric unit

—To demonstrate the practical benefits of an orthopaedic geriatric unit within the context of a district health authority.

The unit comprised 43 beds, 38 of which were for elderly women. Decisions concerning the selection and timing of transfers were made by the orthopaedic

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team with no involvement of the geriatricians. The operational policy stated that all fractured neck of femur cases would be transferred unless there were compelling medical or orthopaedic reasons. Whilst orthopaedic surgeons were available on site to give an opinion, there were no formal joint ward rounds.

Subjects and methods

A prospective comparison was made of the outcome of patients from two geographical sectors, both receiving identical initial treatment at Poole General Hospital. Patients in the study were aged over 65 years and admitted during a period of 4 months. An initial assessment was made by a trained research assistant as soon as possible, and normally within 72 hours of admission. Data were collected on the following factors known to have an influence on outcome in fractured neck of femur: age, sex, fracture type, marital status, residential and social status, level of independence prior to admission as measured by the Clifton assessment procedure for the elderly (CAPE) [9, 10] and, for those living at home, professional support prior to admission.

A medical assessment was carried out between 3 and 7 days post-operatively by a senior registrar in geriatric medicine, who had no involvement in decisions concerning transfer and was blind with regard to the patient's area of residence. Patients were subsequently seen at least twice weekly and formally reviewed every 2 weeks during their inpatient stay.

Pre-existing medical problems were classified as follows:

- Minor problem:* one that exists but is unlikely to affect rehabilitation prospects (examples include diabetes, atrial fibrillation)
- Moderate problem:* one that is likely to cause minor difficulties and may delay response to rehabilitation (examples include osteoarthritis of the knees, mild cerebrovascular accident)
- Major problem:* one that is believed likely to interfere markedly with rehabilitation (examples include marked disability from Parkinson's disease or previous stroke, severe dementia).

Moderate and major problems were classified as 'significant'.

The following outcome measures were examined; —Length of inpatient stay, mortality (30 days post-admission and at 6 months and 1 year post-operatively), change in dependency (CAPE) together with residential status at discharge and 6 months post-operatively. —Analysis was by intention to treat, that is the outcome of patients from the two sectors was compared regardless of whether they were transferred to the orthopaedic geriatric unit. Multiple regression analysis was used in respect of length of stay and change in dependency at 6 months post-operatively to allow for

minor differences between the two populations in possible confounding variables.

Results

Initial status of patients from the two sectors

A total of 155 consecutive incident cases of fractured neck of femur were recruited. The initial status of the two populations is summarised in Table 1. There were no statistically significant differences in respect of age, sex, marital and residential status, dependency (CAPE), pre-existing medical problems, fracture type or cognitive impairment. The median pre-operative interval was similar in the two sectors (sector A: 4 days; sector B: 5 days).

Transfers to the unit

Fifty-five (67%) patients from sector A were transferred to the orthopaedic geriatric unit. The median interval between operation and transfer was 7 days. Fifteen (20%) patients from sector B also received care on the unit. The majority were resident close to the administratively determined boundary. Their initial status did not differ significantly from that of other patients in sector B.

Outcome

The initial outcome of patients from the two sectors is summarised in Table 2. There was no statistically significant difference in mortality occurring within 30 days of admission (chi squared = 0.6, df = 1, $p > 0.5$). Since the median delay between operation and transfer to the unit was 7 days, it was felt that events occurring prior to 8 days post-operatively would not be influenced by orthopaedic geriatric care. A higher proportion of patients from sector B developed 'significant' medical complications during the period from the eighth post-operative day [sector A:12 (18.2%); sector B:18 (28.6%)]. This difference was not statisti-

Table 1. Initial status.

		Sector A (n = 82) (O/G unit)	Sector B (n = 73)
Age (years)	Median	83.0	83.0
	Range	66–98	65–97
Sex	Male	15 (18.3%)	16 (21.9%)
	Female	67 (81.7%)	57 (78.1%)
Residential status	Community	48 (58.5%)	48 (65.7%)
	Institution	34 (41.5%)	25 (34.3%)
CAPE score on admission	Median	7.0 (n = 79)	8.0 (n = 72)
	Range	–10 to +12	–10 to +12
Significant medical problem		51 (62.2%)	49 (67.1%)
Fracture type	Subcapital	36 (43.9%)	44 (60.3%)
	Trochanteric	46 (56.1%)	29 (39.7%)

Table 2. Initial outcome.

		Sector A (n = 82) (O/G unit)	Sector B (n = 73)
Initial mortality (Deaths occurring ≤30 days after admission)		16 (19.5%)	10 (13.7%)
Length of stay (days)			
All cases	Mean	30.2	43.0*
	Median	27.0	34.0*
	Range	3–126	2–258
Excluding initial mortality	Mean	34.7	47.6
	Median	29.5	38.0
	Range	4–126	6–258
Change in residential status at discharge (More supportive environment)		18 (29.0%) (n = 62)	19 (32.8%) (n = 58)

* $p < 0.05$, Mann Whitney U.

cally significant (chi squared = 1.4, $df = 1$, $p = 0.24$). The incidence of surgical complications was similar: 6.8% in sector A and 7.3% in sector B. There was no difference between sectors in respect of mobility at 2 weeks post-operatively.

The median length of stay was 7 days shorter in sector A (Mann Whitney U statistic = 5797, $p = 0.03$). When patients dying before 30 days were excluded from the analysis, there remained a difference in the median length of stay of 8.5 days. Multiple regression analysis was carried out relating length of stay to sector, age, sex, fracture type, operative delay, residential status, CAPE score, and presence of a significant medical problem on admission. One outlier from sector B with a length of stay of 258 days was excluded from the analysis, as were all patients dying within 30 days of admission. When allowance was made for the effect of all other co-variables, patients in sector A were found to have a length of stay 9.5 days shorter than those from sector B ($t = 2.13$, $p = 0.03$). There was little difference in outcome at discharge in terms of change in dependency (CAPE) or residential status (Table 2). The median change in CAPE score from that on admission to discharge was identical (-2.0) for patients from the two sectors (Mann Whitney U statistic 2636.5, $p = 0.55$; point estimate for difference between medians = 0 with 95% confidence interval -1.00 to 1.00).

At six months post-operatively there was no statistically significant difference between the sectors as regards mortality, change in residential status or dependency (CAPE) (Table 3). The median change in CAPE score from that on admission to the 6 months assessment was -1.0 in both sectors (Mann Whitney U statistic = 2140.5, $p = 0.39$; point estimate for difference between medians = 0 with 95% confidence interval -1.00 to 0.01).

There was no statistically significant difference in functional outcome (pain and mobility) at 6 months

Table 3. Outcome at six months post-operatively.

	Sector A (n = 82) (O/G unit)	Sector B (n = 73)
Mortality	28 (34.1%)	22 (30.1%)
Change in residential status (More supportive environment)	12 (22.2%) (n = 54)	16 (32.6%) (n = 49)
Change in dependency (CAPE) (More dependent)	26 (55.3%) (n = 47)	31 (64.6%) (n = 48)

post-operatively. For patients living in the community at the time of assessment, levels of statutory support were also comparable.

Allowing for age, sex, fracture type, residential status, presence of a significant medical problem on admission and operative delay by multiple regression, there were no statistically significant differences between sectors with respect to change in dependency, pain or mobility.

At 1 year after the original operation 5 patients (6.0%) from sector A and 7 (9.6%) from sector B were lost to follow-up. Mortality was similar in both sectors (sector A 44.2%; sector B 40.9%). There was a trend towards a higher proportion of patients from sector B being in a more supportive environment than at the time of admission: 38% compared with 17.5% in sector A. The difference was, however, not statistically significant (chi squared = 3.0, $df = 1$, $p = 0.08$).

Discussion

The findings of the two recently published randomised controlled trials have been judged inconclusive [11]. Kennie *et al.* [4] reported that combined care shortened hospital stay and improved personal independence at discharge. However, there were notable differences between the intervention and control groups in terms of age and mental status at entry to the study, which may have accounted for the apparent improvement in outcome.

Gilchrist *et al.* [5] reported no difference in length of stay, mortality, or placement at discharge. The study size was large enough to detect a 50% change in the chosen outcome measure with 80% power, but smaller changes could not be excluded. An earlier trial by the Centre for Health Economics in York [3] was limited by small sample size and bias. The case for orthopaedic geriatric care therefore remains unproven.

Whilst a randomised controlled trial is the preferred method of evaluation, the choice of a population-based comparison was dictated by local circumstances. In practice, the two groups studied were very similar and multiple regression analysis was used to allow for

the minor differences in their initial status. Given the distribution of change in CAPE scores, it is known that the sample size was large enough to detect a difference of two points on the CAPE scale between the two sectors with 80% power at the 5% level. The transfer of 20% of sector B patients to the orthopaedic geriatric unit would have reduced the power of the study to detect a difference in outcome, but it is unlikely that any major or clinically important difference has been missed. The characteristics of this group were examined and the decision to transfer the unit appears to have been made purely on their close proximity to the geographical boundary rather than their being a clinically selected group.

A statistically significant reduction in length of stay was found and this was achieved without detriment to patient outcome. We estimate that in East Dorset during 1987 a total saving of 4,627 bed-days could have been made, had orthopaedic geriatric care been available throughout the district. The apparent absence of an influence on outcome other than length of stay may be due to a number of local factors. It has been demonstrated that long pre-operative intervals adversely affect outcome in fractured neck of femur [12]. This may have reduced the potential benefit from orthopaedic geriatric care, as would the delays in transfer to the unit. Steps are being taken locally to address these problems. One potential failing of the unit is the absence of joint ward rounds. It is also possible that involvement of the geriatrician earlier in a patient's stay, and particularly in selecting those who are transferred to the unit, would have an influence.

Various aspects of orthopaedic geriatric care might potentially affect outcome, including the greater provision of physiotherapy, occupational therapy and social work input, also the influence of the geriatrician and a 'rehabilitative' approach to nursing. Data on physiotherapy and occupational therapy input showed no difference between sectors but there was a greater average time given by social workers to those resident in sector A. Other studies have indicated that earlier involvement of social workers in discharge planning results in a reduction in inpatient stay [13].

A geriatrician may affect outcome by earlier diagnosis and more effective treatment of medical problems. In addition, his experience of community liaison may facilitate discharge arrangements. For example, in the present study 71% of patients discharged into the community from sector A received a home visit compared with only 37% of those from sector B, suggesting a different approach. Assessment of the geriatrician's influence on the incidence and severity of medical problems is complex. Greater diagnostic enthusiasm may result in an apparent increase in the incidence of post-operative medical problems, although hopefully the severity may be reduced. Medical problems developing 8 days or more post-operatively were examined as this was the period when the

influence of orthopaedic geriatric care would be maximal. The two populations did not differ with respect to the proportion of patients developing mild problems, but fewer developed moderate and severe complications in sector A compared with sector B (moderate: 8% sector A, 13% sector B; severe: 14% sector A, 21% sector B).

We conclude that a team approach in an atmosphere where the elderly patient is the priority is probably the most important factor in reducing length of stay, although this concept is difficult to prove statistically. The opening of an orthopaedic geriatric unit in East Dorset has resulted in a substantial fall in the numbers of orthopaedic outliers at Poole General, with considerable benefits to the hospital.

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